Malawi - Infrastructure Development

Report generated on: May 24, 2019

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Overview

Identification

COUNTRY
Malawi

EVALUATION TITLE
Infrastructure Development

EVALUATION TYPE
Independent Performance Evaluation

ID NUMBER
DDI-MCC-MWI-ENERGY-IDP-2014-v01

Overview

ABSTRACT
Social Impact was contracted by MCC to develop and conduct an evaluation of the Malawi Compact. Specifically, SI has been tasked to “assess the program design and implementation to develop the most rigorous evaluation design feasible, whether it is a performance or impact evaluation, and identify the most appropriate evaluation methodology feasible given the context.”

Efforts to identify a research design that would allow for a rigorously defined counterfactual were unsuccessful, and as a result this design document outlines plans for a rigorous performance evaluation that will aim to measure key outcome indicators early on in the Compact, midway through, and at the end of the Compact, as well as track changes over time. This evaluation is designed to address the core questions of the evaluation (Table 1) Since the proposed design is a performance evaluation, it is important to note that it may not be possible to state with confidence how the power sector in Malawi has changed (or not changed) as a result of the Compact, as it will not be possible to control for other potential causes of change. In some cases, however, it may be feasible to identify and potentially rule out alternative explanations.

The inability to define a counterfactual requires a reformulation of some of the initial evaluation questions originally proposed by MCC, including some core questions included in the SI-MCC contract. In addition, the Evaluation Assessment Report revealed that both SI and MCC had substantial concerns with regard to the original research questions proposed in Social Impact's contract. This is natural given the way that interventions change over time, and that the proposed questions should be feasible to answer based on the data that can be collected as part of the evaluation. Based on SI's comprehensive desk review, information gathered during the scoping trip, and frequent communication with MCC and MCA-M, the SI evaluation team has developed research questions and research approaches for the IDP project components, as proposed in Table 2. The original questions and the suggested modifications for each question are presented in the Appendix.

Research Questions

Through a rigorous performance evaluation, the evaluation design aims to answer the following core evaluation questions and several complementary research questions:

1. What declines in poverty, increases in economic growth, reductions in the electricity related cost of doing business, increases in access to electricity, and increases in value added production are observed over the life of the Compact?

2. What were the results of the interventions - intended and unintended, positive or negative?

3. Are there differences in outcomes of interest by gender, age and income? Sex and income disaggregated information for businesses and households will be pursued to the extent possible.

4. What are the lessons learned and are they applicable to other similar projects?

5. What is the likelihood that the results of the Project will be sustained over time?

6. At the household level, the evaluations shall focus on the following program/project/activities impacts on household and individuals: income; expenditures, consumption and access to energy; individual time devoted to leisure and productive

activities.

7. At the enterprise level, the evaluation shall focus on the potential impact of the program/project/activities on: business profitability and productivity; value added production and investment; employment and wage changes; energy consumption and sources of energy used; business losses.

8. At the regulatory, institutional and policy level, the evaluation shall explore the potential impacts of the program/project/activities on: utility operating costs and losses; financial sustainability; private investment, particularly in generation; expansion of electricity access for customers, particularly the poor.

To answer these questions, the evaluation design will leverage diverse research methodologies with different timelines for data collection. The evaluation design can be broken into three main parts, albeit with some overlap:

· IDP evaluation: The IDP design focuses primarily on an intensive metering effort to measure the technical benefits of the project, including changes in energy delivered, outages, and quality. This will be complemented by focus groups with residents of beneficiary communities.

· Enterprise survey: A panel survey of businesses will be used to evaluate both the PSRP and the IDP.

IDP Evaluation Design

Design Overview

We propose that the IDP evaluation consist of two major parts: (1) intensive metering to determine technical benefits, and (2) focus group discussions with beneficiaries. In addition, some of the activities conducted as part of the PSRP evaluation - specifically work flow analyses of response to outages - will also address IDP benefits made possible by the supervisory control and data acquisition (SCADA) systems.

EVALUATION METHODOLOGY
Pre-Post

UNITS OF ANALYSIS
Individuals, households and businesses

TOPICS

Topic	Vocabulary	URI
Energy	MCC Sector	
Gender	MCC Sector	

KEYWORDS
Malawi, Energy, performance evaluation, ESCOM, MERA, Ministry of Energy, tariff reform, corporate governance, private sector, infrastructure, economic policy, Natural Resources

Coverage

GEOGRAPHIC COVERAGE
Metering - South and Central Transmission backbone investments; North transmission; Lilongwe; New substations

ESCOM survey - national, will target urban employees living near Blantyre, Lilongwe, or Mzuzu.

Enterprise survey - will mainly focus on Lilongwe, will have data for Mzuzu and Blantyre as well.

UNIVERSE
The study population is in the process of being finalized with MCC and MCA-Malawi. The focal points for the evaluation will include enterprises and households.

Producers and Sponsors

PRIMARY INVESTIGATOR(S)

Name	Affiliation
Social Impact	Independent evaluator

FUNDING

Name	Abbreviation	Role
Millennium Challenge Corporation	MCC	

Metadata Production

METADATA PRODUCED BY

Name	Abbreviation	Affiliation	Role
Millennium Challenge Corporation	MCC		Review of Metadata

DATE OF METADATA PRODUCTION
2014-06

DDI DOCUMENT VERSION
Version 2 (June 2014): This version divides the IDP and PSRP evaluations into two metadata catalogues

DDI DOCUMENT ID
DDI-MCC-MWI-ENERGY-IDP-2014-v01

MCC Compact and Program

COMPACT OR THRESHOLD
Malawi Compact

PROGRAM
On April 7, 2011, The Millennium Challenge Corporation (MCC) signed a five-year, USD 350.7 million Compact with the Government of Malawi (GOM) to address the structural, operational and financial inefficiencies of power subsector institutions, and the generation, transmission and distribution capacity constraints faced by the country's power subsector. The five-year implementation period began on September 20, 2013 and will run through September 19, 2018. The MCC Malawi Compact includes three projects: the Infrastructure Development Project (IDP, allocated $257.1 million), the Power Sector Reform Project (PSRP, allocated $25.7 million), and the Environmental and Natural Resource Management Project (ENRM, allocated $27.9 million). Social Impact's evaluation focuses on the IDP and PSRP. In the forthcoming sections of the Design Report, Social Impact (SI) outlines a methodology for a mixed methods performance evaluation of the PSRP and IDP projects. The Report begins with an overview of the project logic that illustrates how the inputs and outputs contribute to achieving the overall project and program objectives outlined in the first amendment to the Compact. This overview is followed by a literature review which focuses on some of the commonly encountered challenges confronting the power sector in Malawi and Africa more generally, including tariff reform, corporate governance, and private sector involvement. The objective of this review is to explore both the history and best practices for overcoming these challenges in developing countries, with a primary focus on Sub-Saharan Africa. The project logic, key findings from the literature review, and guidance from both MCC and MCA-Malawi, informed the IDP and PSRP evaluation designs. The IDP design focuses primarily on an intensive metering effort to measure the technical benefits of the project. This will be complemented by focus groups with residents of beneficiary communities. Some of the activities conducted as part of the PSRP evaluation, specifically work flow analyses of ESCOM response to outages, will also address IDP benefits made possible by the supervisory control and data acquisition (SCADA) systems. The PSRP design incorporates four data collection activities: (1) quantitative indicators from the M&E Plan and Malawi Energy Regulatory Authority (MERA) key performance indicators, (2) workflow analyses with relevant units, such as billing and procurement, (3) a series of largely qualitative research activities (with some mini-surveys included), and (4) a proposed survey of Electricity Supply Corporation of Malawi (ESCOM) employees. Finally, a panel survey of businesses will be used to evaluate both the PSRP and the IDP. The PSRP and IDP designs are structured to answer the evaluation's core questions in addition to the research questions developed in cooperation with MCC and MCA-Malawi. The research questions and data sources for both evaluations can be found in Tables 2 and 3. The later sections of this report include a risk analysis plan, Institutional Review Board (IRB) requirements, an overview of the evaluation team roles and responsibilities, protocols on data access, privacy and documentation, and a dissemination plan. The data collection budget and detailed evaluation Work Plan are attached to this report.

MCC SECTOR

Energy (Energy)

PROGRAM LOGIC

The Compact entails a wide array of activities designed to achieve the Compact's stated goal and objectives. The overarching goal of the Compact is to “reduce poverty through economic growth in Malawi.” The Compact aims to attain this goal by working towards three primary objectives: 1) Reduce the cost of doing business in Malawi 2) Expand access to electricity for the Malawian people and businesses 3) Increase value-added production in Malawi Figures 1 and 2 present the project logics reflected in the M&E plan linking the Compact activities to these higher-level outcomes. These illustrate how each project's activities are expected to affect outcomes related to each of the three Compact objectives. Understanding the linkages that are built into the theory of change (TOC) is fundamental in the evaluation design process. Clearly defined project logics will enable the evaluation team to consider the contribution of the Compact to observed outcomes, support the learning process, and enhance knowledge of the Compact's successes and possible shortfalls. Infrastructure Development Project Problem: The national electric grid in Malawi has one of the lowest generation capacities in Southern Africa, delivered by a woefully outdated transmission system, with a maximum transmission capacity of only 132 kV. The lack of adequate supply and transmission of electricity is exacerbated by high technical and non-technical losses. As a result, few Malawians have access to electricity and those that do experience frequent load shedding and blackouts. Activities: The IDP project comprises four activities: 1. The Integrated Resource Plan Activity entails the development of an Integrated Resource Plan (IRP) that identifies a prioritized list of generation projects that will allow the GoM and ESCOM to meet country's growing demand for power. 2. The Nkula A Refurbishment Activity involves the refurbishment of the Nkula A hydropower plant, which was originally constructed in 1966. The activity will extend the life of the facility of while adding generation capacity of approximately 6 MW. 3. The Transmission Network Upgrade Activity includes the installation of a 400 kV high voltage power line linking Lilongwe to power generation facilities in the south and the development of a 132 kV line to facilitate transmission in the north of the country around Mzuzu. 4. The Transmission and Distribution Network Upgrade, Expansion, and Rehabilitation Activity will occur in targeted locations throughout the country. It will include upgrading existing network connections, up-rating transformers, constructing new substations, and installing control and communications systems, among other actions. Logic: Through increasing generation capacity, upgrading the transmission network, and improving transmission and distribution infrastructure, the IDP project aims to increase available power, reduce energy losses, reduce outages, and improve the quality of primary substations. Lower energy losses, reduced outages, and improved quality of infrastructure should allow households and businesses to reduce their energy costs and increase value added production. The bulk of funding for IDP activities focuses on improving the transmission system to handle added generation in the future. Furthermore, improvements to the transmission system, if coupled with adequate new generation capacity, may allow for the expansion of the distribution network to more households and businesses, increasing access to electricity. Assumptions and risks: Linking the Compact activities with the desired Compact objectives assumes that the gains in improved electricity supply, reliability and quality will be adequate to lead to a measurable improvement in electricity at the level of individual households and businesses such that total energy expenses can be reduced and time efficiencies gained. While the Compact's focus on transmission infrastructure is essential for the future development of the power sector, it means that the Compact will add minimal new generation capacity at a time when demand will continue to increase. MERA is currently developing targets for key performance indicators, which may require the electrical utility, ESCOM, to add up to 45,000 new customers each year for the next four years. Unless substantial new generation capacity is added, which is unlikely to occur during the life of the Compact, the reliability and quality of electricity might actually decrease for ESCOM customers in the short run. Power Sector Reform Project Problem: In addition to infrastructure deficiencies, Malawi's power sector suffers from additional financial, operational, and governance challenges. The electrical utility, ESCOM, is financially and operationally unsustainable due to multiple factors including: low billing and collections rates, insufficient or incorrect customer information, and high technical and non- technical losses. Partially as a result, inadequate investments are made in expanding generation, transmission, and distribution infrastructure or maintaining existing infrastructure. In addition, ESCOM suffers from a number of operational and governance challenges related to insufficient management capacity, unresponsive customer service, weak internal controls, political interference, and low transparency. Broader energy sector governance involving the regulator, MERA, and the Ministry of Energy (MoE) also confronts challenges as Malawi's regulators lack adequate operational cost data to inform tariff design and the sector does not effectively allow for meaningful private sector investment. Activities: The PSRP entails a wide array of activities designed to help address these challenges and problems. The PSRP is divided into three activities with several sub-activities. 1. The ESCOM Turnaround Activity includes a Finances Sub-Activity that entails the development of a detailed financial plan and financial model, which will allow for financial planning over the five-year life of the Compact, and a management information systems (MIS), which will integrate existing information flows from diverse aspects of the utility into one comprehensive system. The Turnaround Activity also includes a Corporate Governance Sub-Activity that involves the development of a Corporate Governance Benchmarking Study and an Operations Sub-Activity, entailing a review of ESCOM's organization structure, embedment of a financial and operational turnaround team, planned improvements to procurement processes, and the initiation of performance audits and a social and gender assessment. 2. The Regulatory Strengthening Activity also entails three sub-activities, including a Tariff Reform Sub-Activity that involves deployment of a tariff advisor to ESCOM and a regulatory advisor to MERA. This sub-activity will involve a cost of service study to accurately determine the cost of providing electricity to diverse customers. A second sub-activity aims to build MERA's capacity through trainings, workshops, exchange visits, peer learning, and a benchmarking study. The third sub-activity, the Enabling Environment for Public and Private Sector Investment Sub-Activity involves supporting a high-level energy advisor to the Ministry of Energy to assist the ministry in master planning, developing an

integrated resource plan, and developing a legal and political environment that permits private sector investment in the power sector. 3. The Power Sector Reform Agenda Semi-Annual Review (SAR) offers a process for Compact stakeholders to jointly monitor the progress of power sector reform efforts and includes regular meetings to measure progress in achieving targets across 25 indicators. Logic: Through these activities, the PSRP aims to achieve several outcomes. These can roughly be summarized as: (i) improving the financial and operational health of ESCOM and rebuilding ESCOM into a strong, well-governed and well-managed utility, and (ii) developing a regulatory environment that supports private sector investment in generation at an affordable cost. These activities might, for example, result in a revision of the Energy Policy and Electricity Act and the development of a framework for independent power producers (IPPs). As such, the PSRP offers an essential complement to the IDP. While the IDP alone might not be able to yield reductions in the cost of doing business if the assumptions listed above do not hold, it is hoped that reforms fostered by the PSRP will produce an energy sector that is financially and operationally sustainable and that encourages continual investment into the future. Assumptions: and risks: Annex IV to the MCA-M Monitoring and Evaluation Plan lists several assumptions underlying the PSRP. The salient assumptions include: · Political will exists to implement and sustain reforms, particularly in processes such as procurement. · Political will exists to permit an increase in tariffs to cost-reflective levels. · The ESCOM Board commits to new organizational structures and human resources (HR) practices. · Technical staff turnover within ESCOM and MCA is minimized. · Parliament approves necessary reforms that permit an enabling environment.

PROGRAM PARTICIPANTS

Please note, selection of program participants is still underway and will be finalized within the next several weeks/months. The team will work with a mix of participants, including ESCOM employees, key informants at MERA and MoE, enterprises, and households. A brief description of participants is below. Focus group discussions (FGD) with residents of beneficiary communities: Focus groups will be convened to ensure homogeneity in terms of sex and age. This will provide the evaluation team with a better understanding of how the benefits of the project might be different for men and women and for youth and adults while providing an environment where participants are more likely to feel comfortable speaking. As a result, four focus groups will be conducted in each electrical community, for a total of 24 focus groups. Participants will be recruited by a recruitment team the day before the focus groups. Recruiters will randomly select households and household members for participation; however, they will utilize a screening instrument to screen for age, sex, income, electricity access, and level of knowledge about electricity in their household. Participants will be offered a small incentive to encourage invited participants to arrive at a predetermined site the day of the focus group. This will entail either a light meal or phone credit. ESCOM Survey: The evaluation team proposes to conduct a survey of a sample of ESCOM employees, which currently number 2,570. While it would be possible to conduct a census of the population of ESCOM employees, the evaluation team will be able to make accurate inferences with a sample of employees. Employees will be randomly selected for inclusion in the sample. Selected individuals will be surveyed in person if they are in the urban areas of Blantyre, Lilongwe, or Mzuzu and by phone if they are not. Enterprise survey: A panel survey of businesses will be used to evaluate both the PSRP and the IDP. A sampling frame of businesses can be easily developed from ESCOM's customer records. There are currently 832 MD customers in the ESCOM network. Of these, 448 customers are concentrated in the South; there are 310 customers in the Central region; and there are mere 66 in the North. Given the relatively low number of MD customers, it will be necessary to expand the population of interest to three-phase commercial connections, of which there are 5,389 in the ESCOM network. The sampling strategy for the enterprise survey is yet to be finalized. Although all business consumers are identified as beneficiaries of the Compact, the benefits might vary across many of these businesses. To focus research efforts as per discussions with MCC and Compact stakeholders, non-businesses, such as government agencies, hospitals, and schools will be dropped from the sampling frame. This list may be further modified once an ongoing ESCOM customer verification program is complete which will yield a geo-referenced location for each enterprise customer. The survey will benefit enormously from this customer verification project. Workflow Studies: The team will meet with a group of male and female individuals in various ESCOM departments, such as the billing department for a group interview/focus group. The team will meet individuals from a range of departments including procurement or customer service, for example. Final selection of workflow studies will occur this Fall, after the team pilots two studies in Malawi towards the end of October.

Sampling

Study Population

The study population is in the process of being finalized with MCC and MCA-Malawi. The focal points for the evaluation will include enterprises and households.

Sampling Procedure

ENTERPRISE SURVEY

A sampling frame of businesses can be developed from ESCOM's customer records. There are currently 832 MD customers in the ESCOM network. Of these, 448 customers are concentrated in the South; there are 310 customers in the Central region; and there are mere 66 in the North. Given the relatively low number of MD customers, it will be necessary to expand the population of interest to three-phase commercial connections, of which there are 5,389 in the ESCOM network.

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Sampling could be based on a random sample from among this population; however, it might be desirable to oversample certain subgroups to ensure the evaluation's ability to generalize about sub-populations of interest and compare across these subgroups. The evaluation team initially proposed ensuring representative samples of the degree of expected Compact benefits; however, Compact stakeholders have raised concerns that it will be difficult to distinguish among beneficiaries. There are several additional variables that could be given priority in determining the evaluation's approach to sampling. These include:

· Geographical location: South, Central, North
· Industry type: manufacturing, agriculture, or services
· Electricity consumption at baseline: MD, three-phase customers
· Quality of service at baseline: industrial park customer, non-industrial park customer

Exact sample size calculations will be performed when the uncertainty about the sampling approach is resolved. However, if we assume that the evaluation will seek to make comparisons across two subgroups (e.g., high/low beneficiaries or higher/lower consumption), then the evaluation would require a survey of 1,000 enterprises across both these sub-groups in order to measure a minimum detectable effect size of 0.18 standard deviations. Given that this will be a panel study that will track the same businesses over nearly a five year time period, it is likely that there will be a high rate of attrition as businesses either fail or decline to participate in future iterations of the survey. As such, the evaluation team recommends adjusting this estimate by an additional 25% to account for expected attrition from baseline to end-line, yielding a sample of 1,250 businesses. If the study aims to ensure comparisons across three sub-groups, then an additional 625 firms would need to be added to the sample. Alternatively, Figure 8 shows the tradeoff between the minimum detectable difference between sub-groups and the sample size. At higher minimum detectible differences, lower samples would be permitted. For budgetary purposes, in the attached budget we have estimated a sample of 1,250 businesses across Lilongwe, Mzuzu, and Blantyre, with a majority of sampling in Lilongwe, where most program beneficiaries will be located.

To further refine this design, the evaluation team would need to obtain and analyze: (1) existing customer data for all MD and three-phase commercial customers, and (2) forthcoming data from the customer verification project, including GPS data and information linking connections to specific substations. Furthermore, it will be necessary to conduct interviews or focus groups with diverse types of businesses in Blantyre, Lilongwe, and Mzuzu to better understand the energy challenges that they confront and how they respond to those challenges. Finally, in consultation with MCC and other Compact stakeholders, the evaluation team will finalize the sampling strategy.

Questionnaires

Overview

Please note the evaluation questionnaires are in the process of being developed, and will be submitted in late September for review.
Household Focus Group Discussion Guide
The evaluation design includes a series of 24 focus groups stratified by beneficiary level, location, age and sex to complement the information provided by the technical benefits portion of the evaluation. Possible themes include the following: sources of and expenditures on electricity and energy costs; reported experiences with electricity, including outages; and attitudes towards ESCOM and the government.

Mini Survey
Upon arrival at the focus group session location, each participant will be asked to fill out a short mini-survey on the above mentioned topics. Responses to these questions will be used as a jumping off point for discussion and these responses can also be analyzed as a small non-representative survey of approximately 200 participants. In the focus groups, special attention will be paid to capturing the differential impacts on men and women. The results will be disaggregated by sex of the respondent, and by the sex of the household-head. It is expected that electricity access and reliability will affect men and women differently, and preferences and perceptions would also differ by sex.

Enterprise Survey
It is likely that the survey will explore the following energy related variables: Costs spent on generators, maintenance, diesel, electricity connections and infrastructure, and fixed and variable electricity fees; Reported outages and problems with energy quality; Time workers spend idle due to outages; Major new investments and expansion of employment; Attitudes of business leaders towards power, relevant government agencies, the Compact, tariffs, cross-subsidizing of household tariffs, views on private sector involvement in the power subsector, and perceptions of corruption and political influence in the energy sector; Satisfaction with ESCOM, experiences obtaining a connection, and customer service related experiences since becoming a customer revenue and profit: Experiences in other countries suggest that entrepreneurs are hesitant to provide accurate revenue and profit information.

Data Collection

Data Collection Dates

Start	End	Cycle
2014-10-20	2014-10-31	Preliminary baseline
2015-01-19	2015-02-09	Enterprise Survey baseline/HH FGD
2019-08-01	2019-10-31	Enterprise Survey endline/HH FGD

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Data Collectors

Name	Abbreviation	Affiliation
Invest in Knowledge	IKI	

Data Processing

No content available

Data Appraisal

No content available